CONSTRUCTION

A Report on the Industry

June 2005

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ABSTRACT

This paper completes a comprehensive five-month study of the US domestic and international construction industry. It seeks to define the industry, understand current conditions, and determine industry trends as they relate to the generation of US national power via the construction industry. It reviews several challenges confronting the construction industry and the role of government in overcoming these challenges. Four essays are included to provide a deeper examination of several issues uncovered during our industry study.

The construction industry is a powerful engine for the U.S. economy, as a basic industry, it provides the infrastructure that creates strength and stability in our national Gross Domestic Product (GDP). Rather than being dominated by a few large companies, the industry is composed of many small companies specializing in local work. The few large firms concentrate on the mega projects both domestically and internationally. The success of both sectors is vital to our national interests. The vitality of small businesses in the construction industry creates jobs, fuels the economy, and enhances the quality of life for all Americans. Meanwhile the ability of the large US firms to compete globally is an essential element in our projection of national power overseas.

In 2004, construction continued to track towards a healthy and moderately profitable industry despite clouds looming on the horizon. The major source of growth in the US market has been the remarkable run up in the residential sector. The growth in the residential construction outpaced growth in the other sectors of the industry although rising interest rates may put a damper on this trend. A rise in non-residential construction should offset the decline in residential building and allow the industry's growth to continue. Challenges facing the construction industry in the future include a slowing economy due to rising interest rates, chronic shortages of skilled and semi-skilled labor, and increasing prices for fuel, health insurance, and construction materials. Overall, the industry should remain healthy in 2005 with growth prospects both domestically and internationally; it can continue to support national security objectives and is capable of surging to meet critical national security needs.

Throughout this year we have found that industry was very supportive of the ICAF program (both domestically and internationally). We are very thankful for their continuing support of this program and hope that they also gained from our studies.

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PLACES VISITED

Domestic:

The Washington Group, Washington D.C.
CIRA Center, Brandywine Reality, Philadelphia PA
Naval Shipyard Redevelopment Office, Philadelphia PA
Design-Build Project Delivery Systems, Washington DC
Parsons-Brinkerhoff, New York, NY
World Trade Center, New York City, NY
Port Authority of New York, New York, NY
American Subcontractors Association, Alexandria, VA
National Association of Homebuilders, Washington, D.C.
United States Capitol Visitor Center Project, Washington D.C.
US Embassy Construction, OBO-State Department, Washington D.C.
American Society of Civil Engineers, Washington D.C.
Associated General Contractors of America, Alexandria, VA
Virginia DoT, Wilson Bridge Project, Alexandria, VA
Sheet Metal Workers Union, Local 100, Suitland, MD
Stromberg Sheet Metal Works, Beltsville, MD
National Association of Homebuilders, Washington, D.C.
Construction Engineering Research Laboratory (CERL), Washington D.C.
San Francisco District HQ, U.S. Army Corps of Engineers, San Francisco, CA

DPR Construction, Redwood City, CA
ModTech, Perris, CA
Magnolia Power, Pasadena CA
Ralph Parsons Inc, Pasadena, CA
The Port of Oakland, Oakland, CA
Golden Gate Bridge Highway and Transportation District, San Francisco, CA

International:

Kajima Corporation, Tokyo, Japan
Taisei Corporation, Tokyo, Japan
Obayashigumi Corporation, Tokyo, Japan
Boso No Mura Museum, Tokyo, Japan

American Chamber of Commerce, Bangkok, Thailand
National Securities Public Company Limited, Bangkok, Thailand
New Bangkok Airport Development Project, Bangkok, Thailand
Hemaraj Development Co., Chonburi Industrial Estate, Thailand
Chao Priya River, Bangkok, Thailand
Hemaraj Development Co., Laem Chabang Industrial Estate, Thailand
Laem Chabang Port Authority, Laem Chabang, Thailand

The United States Embassy, Beijing, China
Three Gorges Dam, Yichang, China

INTRODUCTION

The overarching goal of all US policy is the creation and expansion of US national power. The construction industry assists in the development of US national power by creating the public and private infrastructure, which forms the foundation for our economic and military elements of national power. This study seminar completed a broad-based review of this vital industry by learning from guest lectures, conducting research and study, and visiting construction sites on both the east and west coasts of the United States and during international travel to Asia. We are grateful for the contributions from representatives from construction contractors, trade unions, professional associations, research institutions, and U.S. and foreign governments, who provided seminar members a wide range of perspectives on the competitive conditions, challenges, and trends of the industry. Seminar members gained valuable, first-hand insight into the complex issues and challenges facing the industry during visits to construction and infrastructure mega project sites.

This study describes the current condition of the American construction industry, assesses the challenges facing the industry, and makes recommendations for future actions. Individual essays address emerging issues associated with industry impacts from antiterrorism protection, construction in Asia, post-war reconstruction, and the construction industry in the Ukraine. Our final analysis finds that while not without its challenges, the construction industry remains well positioned to continue to support our national security objectives.

CONSTRUCTION INDUSTRY DEFINITION

The construction industry includes all companies primarily engaged in construction as general contractors, operator builders, heavy construction (airports, highways, and utility systems), and construction by specialty trades. Also included are companies that engage in the preparation of sites for new construction and in subdividing land for building sites. Construction work may include new work, additions, alterations, or maintenance and repairs. Construction work is often described by either type, residential (home building) versus non-residential (commercial and government buildings and infrastructure projects), or by funding source, public versus private. According to the U.S. Department of Labor, Bureau of Labor Statistics (BLS), the construction sector consists of about 700,000 companies with paid employees and approximately two million companies operating as self-employed firms without paid employees[1]. U.S. companies account for just over a third of the top 225 international contractors. Six U.S. companies, Kellogg Brown & Root, Bechtel, Fluor Corp., ABB Lummus Global, Foster Wheeler Ltd., and Jacobs, rank among the largest 25 of international contractors and four, Bechtel, Fluor Corp., Centex, and Kellogg Brown & Root, are among the top 25 global contractors[2].

While the proportion of non-residential construction spending has decreased relative to the amount of residential spending, this segment of the construction industry is vital due to its ability to create national power. As a consequence, the primary focus of our study was the non-residential sector. Public construction as of March 2005 was $239,874M[3], (state and local $222,481M and Federal $17,393M) representing a 2.7% increase in the past 12 months. In the nonresidential sector, industrial buildings (including warehouses) account for the greatest share of buildings (more than 15%), followed by offices, schools, and public (government) buildings (between 8% and 14% each). Approximately 90% of all nonresidential construction is less than four stories[4]. Despite

this smaller dollar value, it is important to note that a majority of the nation's infrastructure is produced and maintained through public construction funds.

Private construction represents a majority of the spending and includes projects of nearly every type – residential, commercial, and privately funded infrastructure. Private construction as of March 2005 amounted to $807,390B (residential $578,680M and non-residential $228,709M) which overall was an 11.3% increase from the same period in 2004[5]. Residential construction has been the shining star for much of the last two years. Housing starts jumped 4.7% in January 2005 to a seasonally adjusted annual rate of 2,159M units, the highest pace in 21 years[6]. This rate for 2004 was 5.7% above 2003. Nonresidential spending on construction rose 3.9% to $222.2B, 3.0% above the 2003 spending[7]. Projections are that the construction markets will shift from the housing boom of the past two years to a nonresidential building upturn fueled by the growing economy in the latter half of 2005[8].

While our studies did not emphasize residential construction, residential construction is an important contributor to the US domestic economy as home sales lead to other consumption. Traditionally, the residential market is cyclical and more volatile, in comparison to the more stable non-residential market. For instance, sales of new single-family houses in January 2005 fell by 9% from December. Of greater concern is the number of unsold new houses, which rose for the seventh straight month, and was 17% higher at the end of January than a year earlier in 2004[9].

In a final analysis, the construction industry's contributions to the US gross domestic product (GDP) exceed the resources employed befitting an industry which fuels the creation of national power. The value of construction in 2003 totaled $916 billion, 8% of the GDP, considerably higher than the construction industry's share of employment, 6.9 million employees.[10] In February of 2005, these numbers rose to $1.047 trillion for the value of construction and 7.2 million for construction employment according to the Bureau of Labor Statistics (BLS) with the industry contributing more (a 1.7% increase) than any other industry to earnings growth by state. This is despite seasonal conditions, which adversely affect the industry during the winter season.

-International Perspective: The global construction industry is the single largest industry in the world. In 2004 the total value of the global construction industry (including the US share) exceeded four trillion dollars[11]. Of even greater importance, 25% of the world's workforce worked directly for the construction industry or an entity supporting construction. Construction work is a tool to stimulate economies and project foreign policy. From 2003 to 2004, the global construction industry grew by 6.6% and is expected to grow at the same rate until 2008.[12]

In 2003 the largest global construction firms were *Vinci* of France ($12 Billion (B) domestic/$8B international revenue)[13], and *Skanska* of Sweden ($3B domestic/$14B international)[14]. The largest U.S. international construction firm is *Bechtel* ($7B domestic/$6B international revenue), which specializes in both petroleum and transportation construction[15]. The largest international construction market is Europe. The second largest international construction market is Asia/Australia with China the single fastest growing market. Transportation is the largest sector in the international construction market (27.5%), followed by general building (25.4%) and petroleum infrastructure (18.7%). Real and projected construction spending (in billions) for the top five markets are as follows:[16]

	2003	2004	2005	2006	2007	2008
Country						
US	1039	1159	1210	1218	1244	1288
Japan	464	507	544	571	584	608
China	242	269	300	338	388	440
Germany	221	247	258	267	282	292
France	173	197	208	218	234	245

- Strategic Approaches: Climate, regulations, and political/social conditions mandate that all international construction is "local". International construction firms sell technical expertise and occasionally equipment but rely on local firms for labor and material. Although market strategies reflect this high reliance on local entities, they vary by region. U.S firms tend to use strategic partnerships to penetrate a market. European firms primarily use acquisitions to penetrate the U.S. market (e.g., Germany's *Hoctief* recently acquired *Turner Construction Corp.).* In China, the world's fastest growing market, the government favors joint venture arrangements to shorten the learning curve and limit the cost of acquiring technical knowledge for their indigenous firms. However, as competition in the Chinese market intensifies and pressure on profitability increases, more and more western firms in China are shifting away from joint ventures to strategic partnerships[17]. For 2003 the combined revenue for the top 225 international contractors rose 20% to $140B[18]. European firms enjoyed a 15% increase while Chinese firms experienced a 17% increase; the greatest gains were for U.S. firms, which increased revenue by 41%[19].

- Government Support: The role of government in international construction varies. Most Western nations (e.g., U.S. and Europe) have programs to support exports through government-provided loan guarantees; but, developing countries, particularly Korea and China, have direct government involvement. Korea uses international construction as a major export and subsidizes mega projects in the Middle East. In China the government uses state-owned construction firms to keep competition fierce and profit margins low. In the U.S., direct government support for the international construction industry is limited primarily to tax breaks for expatriate labor; however, international firms, competing for projects in the U.S. claim environmental laws and building/safety codes, foster an unfair advantage to U.S. firms. In Europe, public/private partnerships are the latest trend to stimulate increases in infrastructure spending.

- International Market Focus: At first glance, the size of China's construction market does not seem to warrant the attention given. In 2004 the Chinese construction industry was valued at $269B, about one fourth the size of the U.S. market. But considering that the average building cost per square meter for an air conditioned office is $70 in Shanghai compared to $550 in New York[20], in relevant terms, $269B is equal to (or exceeds) the trillion dollar U.S. market. The World Bank estimates that between now and 2015 half of the world's new building construction will take place in China. The total volume under construction in China reached 1.5 billion square meters in 2004. In Beijing alone, one billion square feet in commercial or new residential space is being built or is in the pipeline for the next three years as compared to 250 million square feet of space expected for all of Manhattan. China's urban population is estimated to grow by an additional 150 million people over the next 20 years. The ramifications from the massive

and rapid development of China are significant. China's insatiable demand for construction materials fuels inflation and is behind many of the world-wide shortages. The price of coal has risen from $43 a ton to $123 per ton; steel mill products have jumped 48%; and, ready mix cement has gone up 30% in two years. Yet an even greater potential concern is what happens if China's construction market collapses. Estimates are that at least 20% of all outstanding loans held by big Chinese banks are in default[21]. Any decline in the Chinese market would free up resources and increase competition for the other international projects.

CONSTRUCTION INDUSTRY CHALLENGES

Despite the current health of the industry and its prospects for growth the industry is not without significant challenges for the future. If these challenges are not addressed, the industry as a whole could suffer and impact the ability to generation national power

- Inadequate Public Spending: Our infrastructure is "crumbling before our eyes due to insufficient funding" according to a report released by the American Society of Civil Engineers on April 20, 2005. Their assessment of 12 categories of infrastructure covering both the current condition and a four-year trend resulted in an overall grade of D, falling from a D+ in 2001 and 2003, with decreases in 7 of the 12 categories[22]. The report recommends spending $1.6 trillion in public and private funds over the next five years just to bring the nation's infrastructure up to acceptable standards[23].

- Increasing Interest Rates: Just as declining interest rates fueled the expansion of the residential construction market, rising rates is a threat to its continued expansion. In response to inflation concerns the Federal Reserve has raised the short term interest rate eight times in the past 18 months[24]. The rise of the short-term rates have led to increases in the rates on mortgages and longer term loans making it more expensive and difficult to secure financing for construction projects. As most construction projects require some financing, they are highly sensitive to interest rate increases.

- International Corruption: The number one issue confronting the international construction industry is corruption, where the paying of bribes is routine. Bribes are paid for prime/subcontract contract awards, for flexibility in code/regulation enforcement, and for materials. *Transparency International (TI)*, a Berlin based organization set up specifically to address corruption, says that international construction is the industry most likely to bribe followed closely by the defense industry[25]. Even though the Anti-Corruption Act prohibits the paying of bribes, U.S. firms have a high propensity to pay bribes and are on par with firms from Japan[26]. Firms from Russia, China, Taiwan and South Korea are the worst offenders while firms from France, Spain, Germany, U.K. and Singapore have the cleanest records. The cost of corruption is hard to measure but unethical acts are estimated to cost the U.S construction industry up to $40B a year[27]. *TI* is pushing hard for more government and non-government organizational intervention.

- Skilled Labor Shortage: In the last two decades, a lack of skilled workers has hindered the construction industry resulting in high bid costs, escalating training expenses, increased turnover, and long lead times. The construction industry currently employs about 5.2% of the national workforce and is projected to grow by more than one million jobs between 2002 and 2012.[28] Construction, like other industries, is short of workers primarily due to demographics. As Baby Boomers retire; the sheer number of workers is not matched in succeeding generations, thus the available labor pool shrinks. The construction industry is one of the first to feel the effects of this change as construction

work tends to attract the younger workers. Work force analysts readily indicate that construction industry concerns are justified:

> "The percentage of skilled construction workers aged 25 to 34 has declined from 37.5 percent to 28.5 percent between 1988 and 1997, according to the Associated General Contractors of America (AGC), while the percentage of those aged 35 to 44 jumped from 22% to 31.5% over the same period. AGC estimates the average age of a construction worker is 47."[29]

The decline of unions and organized labor also affected the construction industry's labor supply. The general shift of American workers away from unions, which offered training and apprenticeships, and into the open labor market also diminished the skilled labor pool."[30]

- S**tandard and Regulations:** Regulations and standards provide a means for customers and oversight authorities to objectively evaluate construction activities. Business pressures and common sense have forced a great deal of consolidation and standardization of residential building codes; but, the process is not yet complete. There currently are two competing models for a national building code - the National Fire Protection Association (NFPA) 5000 Building Construction and Safety Code and the International Code Council (ICC) International Building Code (IBC).[31] Adoption of either code as a national standard will increase the ability of the construction firms to compete within the US without having to tailor designs to the local code.

The challenges of a common building code are compounded when competing in overseas markets. Most industry officials see the universal adoption of International Organization for Standardization (ISO) standards as a partial remedy to overseas risk. The ISO 9001 and ISO 14000 are as close to global standards as can be found today; but, it should be remembered that while the ISO standards have been widely adopted; they are not mandatory for any party and therefore they are not as directive as specific codes or rules.

IMPORTANT TRENDS

The construction industry is clearly evolving into a new activity phase. During our studies, we found clear trends in the industry representing fundamental shifts in direction rather than adjustments at the margin. These include renewed emphasis on Research and Development (R&D) both in the US and internationally, increased use of information technology in the construction industry, and growing interest in privatization of previously public services.

Research & Development Public and Private (Non-Military): Borne out of the tragic fire that destroyed 80 blocks in Baltimore in 1904, the National Bureau of Standards emerged as the initial conduit for R&D spending in the US[32]. Since this time, a number of independent R&D organizations have been created to support construction research and act as an advocate on behalf of construction related firms.

- **NSF International**, founded in 1944 as the National Sanitation Foundation, is known for the development of standards, product testing, and certification services in the areas of public health, safety and protection of the environment. The NSF Mark is placed on millions of consumer, commercial and industrial products annually and is trusted by users, regulators and manufacturers alike. The National Science Foundation requested $5.036 billion for FY 2003, $239.9 million or 5.0 percent over FY 2002[33]. The priorities established in this Budget Request take into account both growing needs and

expanding opportunities for high-impact investments to strengthen U.S. world leadership in science, engineering, and technology. They aim to keep the nation's science and engineering enterprise healthy, dynamic, and relevant.

- National Institute of Science and Technology (NIST) – founded in 1901, NIST is a non-regulatory federal agency within the U.S. Commerce Department's Technology Administration.[34] NIST's mission is to develop and promote measurement, standards, and technology to enhance productivity, facilitate trade, and improve the quality of life. With an operating budget of about $858 million, NIST operates in two locations: Gaithersburg, MD., and Boulder, CO. NIST employs about 3,000 scientists, engineers, technicians, and support and administrative personnel and partners with 1,400 manufacturing specialists and staff at affiliated centers around the country.[35]

- ASCE (American Society of Civil Engineers) – has a mission statement to promote knowledge and understanding of the rich history of the American Society of Civil Engineers and the civil engineering profession including their origins, core values, ethics, people, projects, and programs. As the oldest national professional engineering society, the American Society of Civil Engineers' core purpose is to advance the art, science and profession of engineering to enhance the welfare of humanity. ASCE provided nearly $3 million in research and grants for construction in 2003.[36]

- Construction Industry Institute (CII) is a member-driven research institute for engineering and construction that is comprised of more than 90 member organizations, representing leading owners, contractors, and suppliers in both the public and private sectors. The members fund studies at leading universities to identify ways to improve the planning and execution of major construction projects. The results from CII research are available to the entire industry. Beyond the research comes the hard task of implementing the ideas into the construction process. CII offers many tools to help in implementation and also can assist in educational efforts, benchmarking, knowledge management, globalization, and breakthrough ideas.[37]

- Coordinating Research Initiatives "Research initiatives across the industry I suspect are not very well coordinated," says Mr. Wayne Crew, Associate Director - Research, at CII.[38] Mr. Crew believes Mr. Hans Van Winkle, Director of CII, and Mr. Jesus de la Garza, Director of IT and Infrastructure Systems at NSF, have discussed a national agenda on improved control in the industry's research planning. "However, I do not believe any plans are in place as of yet."[39] CII operates as a consortium of industry representatives and construction firms that have a vested interest in the research benefits available for the industry. As consortia, they bring expertise, varying goals, and perspectives to the research funding and management process. This type of overarching professional alliance should be implemented to look at the total research requirements and agenda for the industry, whether funded with private dollars or public. This type of approach would enable the effective utilization of the research investment dollar and eliminate redundancy. Assimilation of research into the industry could be assured with more immediate benefit. The prevailing fear of introducing newer technologies and materials to construction design, due to code and enforcement concerns, could be overcome through sponsorship by a professional foundation.

Research and Development – Military. The construction resources of the U.S. military are aimed toward achieving the Department of Defense (DOD) goals of assured warfighting readiness and sustainability. While the preponderance of activity supports new construction or repair of existing facilities, a significant part of the facility engineering

focus is on initiatives to improve living and working conditions, reduce operations and maintenance costs, conserve energy, and increase productivity. This is the area where the research and development initiatives of the United States Army, Air Force and Navy military construction and engineering groups bring their power to bear.

The U.S. Army Corps of Engineers research and development program runs the gamut from basic to applied research. The three major program areas are: research, development, test and evaluation; civil works research and development programs; and mission support or reimbursable research and development programs. In order to carry these programs out, the Corps of Engineers combined the operations under the oversight of a single entity, the U.S. Army Research and Development Center.[40] Though the seven laboratories are geographically dispersed, the laboratories collaborate closely on a variety of problems in warfighter support, installations, environment, water resources, and information technology[41]. The one great advantage provided by the military research and development labs is the willingness for technology transfer, not only to other military services, that have already leveraged the power of these labs to project the capabilities of the combat engineer as far as the warfighter needs it to go, but also to the many intergovernmental entities, private industry, academia, and foreign government and private industry that can apply that advantage. The shared collaboration increases the overall benefit among those that have entered a formal partnership, benefiting the construction industry at large.

Incorporation of Information Technology Companies are beginning to move to the next phase of the Information Revolution – from technology superiority to standardized and integrated information platforms. The U.S. construction industry is making progress in leveraging Information Technology (IT) to improve efficiency but lags behind other industry sectors. The ability to manage information is critical in an era of variability, uncertainty, complexity, and ambiguity.

The cyclical 'boom-or-bust' nature of the construction business, adverse weather conditions, and environmental constraints are just a few of the reasons for the slow pace of IT integration in the construction industry. These elements increase risk and, combined with the typical low profit margins of the industry, slow the development and introduction of new technologies in this sector of the economy.[42] However; the failure to change from traditional methods often leads to time and cost overruns and makes firms non-competitive with the early adapters. One study listed the cost of inadequate interoperability in the U.S. capital facilities industry at $15.8 billion per year.[43] As a result, there have been an increasing number of calls to move to more innovative, collaborative, and productive ways of inserting IT into the construction industry.[44]

IT tools fit into two categories - operational and enterprise. From a military standpoint these terms are analogous to tactical and strategic tools. Tactical tools are those that improve an operations' efficiency such as Computer Aided Design (CAD), computer managed production lines, laser guided measuring devices, GPS, etc[45]. The individual adoption of tactical tools does not necessarily contribute to overall project efficiency. As an example, a project will not gain from having an efficient, IT-savvy sub-contractor if an inefficient traditional method subcontractor causes project delays. Strategic IT tools are those that reduce overall inefficiency and provide an enterprise-wide solution. These tools are increasingly web-based versions of existing tools that allow for real-time collaboration with all project stakeholders. Strategic IT tools include CAD, document management, data

warehousing, change order management, planning and scheduling, and other shared collaboration tools[46].

As the industry continues into the information age, there is potential for seamless communication between designers, builders and operators. Effectively leveraging and integrating IT capabilities allows firms to remain competitive in an increasingly interconnected and competitive global market economy. This type of efficiency allows the industry "to change its focus from short-term projects to long-term strategic planning with an emphasis on customers and the enterprise."[47] To compete in this environment, firms need to incorporate integrated design/build/operate business models and turn from stovepipe-type organizations. If successful the adaptation of IT in the construction industry has the potential to make the traditional "boom-or-bust" cycle that spurs low profit margins into a relic from the past.

- Infrastructure Privatization. The economics and risks involved with privatization of infrastructure are multifaceted and differ with each country; however, revenue risk, construction risk, and political risk are recognized by many experts in this field as universal. According to Xueqing Zhang's *"Critical Success factors for Public-Private Partnerships in Infrastructure Development,"* success in this area can be distilled down to five main areas: (1) economic viability, (2) appropriate risk allocation/ reliable contractual arrangements, (3) sound financial package, (4) reliable and strong technical strength, and (5) a favorable investment environment[48]. Zhang also sites failure of Public-Private Partnership (PPP) projects; for example, in Thailand where two build-operate-transfer projects failed due to political instability and in Malaysia a privatized national sewage project failed because of pressures to reward cronies, contractors, and government officials. These examples demonstrate how risky infrastructure development can be in developing countries; but, the challenges of infrastructure privatization are not limited to developing countries. Within the U.S., there is increasing interest in privatization of public works projects in response to budgetary pressures and the declining state of U.S. infrastructure as highlighted by ASCE ratings. In addition, the American Water Works Association released a study in 2001 stating that at least $250 billion will be needed over the next 30 years just to upgrade and maintain the current drinking water systems in the United States[49]. The following is a "non attributable" statement made by a visionary CEO recently: "Oil is a very important liquid resource that requires immediate attention; however, the next ***liquid gold*** resource that will require worldwide attention is ***water.***" To be fair, there have been a number of successful privatization projects including the $700+ million contract for the San Diego Expressway Limited Partnership (SR125) and the central Texas Turnpike project, a 65 mile, $3.6 billion public-private project[50].

GOVERNMENT GOALS AND ROLES

The ability and desirability of the government directly stimulating the U.S. construction industry is doubtful. Doing so would require a change to the tradition hands-off policy that the government has held toward business. However, the government can enact policies that provide indirect stimulation for the industry by improving the input conditions. Most important of these are:

- Increasing the Available Labor Pool. Two government-private cooperative initiatives show promise for helping alleviate labor shortages, improve productivity, and increase employment prospects: (1) The Helmets to Hardhats program and (2) the

Department of Labor Employment and Training Administration (ETA) program[51]. Helmets to Hardhats is an effort that offers military personnel, due to leave service, opportunities to enter directly into apprentice programs. The military person gains from a solid start on a second career and the industry benefits by accessing workers who have some skills and a proven work ethic.[52] Similarly, each year the ETA invests over $15 billion in the public workforce investment system to provide employment and training services across what it deems as the twelve high-growth industries[53]. Construction is one of the industries included because of its direct impact on the nation's economy. ETA's main avenue is through improving the construction industry's image with outreach programs describing the benefits, safety records, and promising careers available within the profession.[54] Their campaign reminds high school graduates:

> "Construction is still an industry where you can climb the ladder of success as high as you want. Moreover, construction jobs pay well. U.S. Bureau of Labor Statistics figures show the average construction job pays 23 percent more than private-sector jobs overall. The opportunities for women, minorities, youth and others are endless."[55]

A final promising means of addressing the labor shortage would be to adopt a more liberal immigration policy. The industry is now seeking methods to legally increase the pool of laborers entering from outside the United States. Experts say President Bush's recent immigration proposal to allow undocumented workers to keep their jobs and attain legal status could help alleviate the construction industry's long-term work force shortage.[56]

- **Stimulate R&D Investment** Unlike US firms, international construction firms make significant commitments to solution-development (tactical R&D aimed at the reduction of construction program costs) during the bidding and construction phases of a project. Taisei Corporation, in their presentation to the ICAF construction industry study team, alluded to the commitment their firm makes to the establishment of proprietary construction techniques during the construction phase. This provides a competitive advantage for this international firm. While the U.S. industry does benefit from the R&D efforts mentioned above, the lack of true unity of effort in the R&D field will limit the ability of U.S. firms to be true innovators. Innovation is a key U.S. competency that must be retained since we can not compete on labor costs with the developing nations.

Domestically, the uneven imposition of building codes tend to disincentivize firms from making R&D investments for fear of raising conflicts with code requirements or contract specifications. As a result, U.S. firms instead rely on the R&D efforts of various trade groups or associations, but this approach does not provide the same results as the focus R&D carried out by the international firms. Correcting this situation requires some level of government involvement and incentives. First, construction codes should be written to encourage innovation rather than enforce the status quo. Second, the government should provide tax-based incentives to firms that develop solutions and alternatives that improve scarce material usage (such as cement or steel) and improve industry productivity. Third, anti-trust laws should be rewritten to encourage industry consortia, construction firms, and engineers to work together to pool resources and prioritize R&D initiatives within the US industrial base, as is the case internationally.

- **Encourage the Use of Public/Private Investments**. The need for additional infrastructure investment is clear. The U.S. Government needs to look closer at the available funding for our nation's infrastructure and work with industry to develop

innovative solutions to financing capital investments. A healthy infrastructure must be maintained to support a global economy and social well being. Privatization of infrastructure can be part of the solution if the risks to investors are lowered and investment is encouraged.

IMPLICATIONS FOR NATIONAL SECURITY

The U.S. construction industry plays a vitally important role in national security. The industry enhances America's influence in the global community and supports the sustainment of the armed forces during long-term conflict. The impressive response by the construction industry to rebuild the World Trade Center, Pentagon, and Iraqi infrastructure clearly demonstrates that U.S. construction firms can surge quickly and effectively.

While there are no significant concerns about the readiness of the construction industry to contribute to national security, some challenges are on the horizon. These challenges relate directly to the role that the construction industry plays in the economic health of the U.S. First, rising costs to support the Global War on Terrorism could impose financial constraints for federal funding necessary for domestic military construction projects and public infrastructure upgrades critical to ensuring the military can mobilize when needed. Second, the lack of federal funding directly affects the ability of the industry to maintain and construct additional infrastructure for domestic use – further deepening an already $1.6T deficit. Other items outside direct federal control are shortages and increased international demands for critical materials needed to support military needs. The Government can, however use the Defense Production Act and other authorities to help ensure that critical materials and equipment are dedicated to meeting national security and civil emergency requirements[57]. Finally, a major problem for all U.S. industries, including construction, is the looming labor shortages for both technical professionals and skilled technicians which could impact the future of the industry. Any of these factors could have detrimental impacts on the ability of the construction industry to provide future readiness and may require Federal intervention to assist this important industry.

The challenge for the U.S. government is how to enable the future health of the construction industry without imposing too many restrictions or conditions. To accomplish this goal we make the following recommendations.

POLICY RECOMMENDATIONS

- State and Federal Governments should prioritize the restoration of the nation's basic infrastructure and increase funding outlays for public infrastructure projects.
- State and Federal tax laws should be changed to promote private investment and development of Public-Private Partnership projects.
- Congress should provide encouragement/financial assistance to increase the pool of skilled labor for the industry. The solution must include a combination of apprentice-training programs, immigration reforms, and transition assistance programs.
- State and local jurisdictions should adopt uniform building codes and standards to allow for the efficient transfer of designs across state and local borders.
- Federal funding should be directed to increase R&D investment in construction methods and materials to maintain a competitive advantage for U.S. companies in the international market.

CONCLUSIONS

The construction industry is one of our nation's largest employers and consistent contributor to the nation's GDP. The general economic expansion over the past 20 years and the housing market boom in the past decade have emphasized the construction industry's importance to the nation. Both the short-term and long-term outlook for the industry is trending positive; but, there are areas which do require attention if this trend is to continue. Most pressing of these needs are the looming shortage of skilled workers, increasing budgetary pressure that reduces the effectiveness of the current infrastructure reinvestment program, and growing competition from foreign firms both in the international marketplace.

After five months of intense study, to include research, lecture, discussions, and observations, we find that the U.S. construction industry remains a vital contributor to both our national economy and our national security. As demonstrated by the reconstruction efforts in Afghanistan and Iraq (as discussed in essay 3), the construction industry is vital to the accomplishment of national security objectives.

Government involvement has largely had a positive effect on the construction industry, especially in the areas of improving building quality, worker safety, and environmental protection. Future government policies must be carefully crafted to improve the global competitiveness of U.S. industry. With approximately 25% of the world-wide construction market, the U.S. market sets many of the standards for the world. Given this leadership position, the U.S. industry and government must partner to increase the capability to create national power via the construction industry.

ESSAYS

Essay #1. – TERRORISM, FORCE PROTECTION AND CONSTRUCTION

This paper addresses the U.S. approach, led by the Department of Homeland Security (DHS), to protect our critical infrastructure and key resources (CIKR), the basis for this approach, key accomplishments to date and critical issues which remain. It also covers the Department of State's (DOS) program for securing and replacing our embassies to protect personnel and facilities.

Summary and Evaluation of the Major Efforts to Protect America's CI/KR

Strategies:

The National Strategy for the Physical Protection of Critical Infrastructures and Key Assets (February 2003) serves as a critical bridge between the National Strategy for Homeland Security and the national protection plan which was subsequently developed by DHS.

Homeland Security Presidential Directive/HSPD 7 (December 17, 2003) establishes the national policy for Federal departments and agencies to identify and prioritize U.S. critical infrastructure and key resources and to protect them from terrorist attacks.

The National Infrastructure Protection Plan (NIPP) provides a consistent, unifying structure for integrating critical CIP efforts into a national program. Development of the NIPP is an ongoing, evolving process that requires the participation of all stakeholders from the private sector, state, local, and tribal entities, and the Federal Government. The NIPP outlines how DHS and its stakeholders will develop and implement the national effort to protect infrastructures across all sectors. The Interim NIPP was issued in February 2005 and is based upon a risk management framework that takes into account threats, vulnerabilities, and consequences.

Key Accomplishments to Protect CI/KR to date are: (1) Enhancing the Homeland Security Advisory System for notifying citizens of threats; (2) Developing the Interim National Infrastructure Protection Plan (NIPP); (3) Building a robust cadre of experienced intelligence analysts within the DHS; (4) Establishing meaningful partnerships with state, local, and private sector entities; (5) Vastly improving threat and CIP information sharing among all Federal stakeholders; (6) Reducing the nation's vulnerability to cyber-attacks; and (7) Establishing the Homeland Security Operation Center (HSOC) for situational awareness.

Challenges Remaining for Fully Protecting CI/KR, include:

- Strengthening the process for infrastructure protection through organizational and roles consolidation changes within the Department of Homeland Security;

- Strengthening the policymaking function by creating a DHS Undersecretary for Policy and empowering the DHS Deputy with broader responsibilities for its oversight;

- Assuring government unity of effort in CIP through early issuance of a final NIPP; and

- Justifying more appropriate government spending for CIP by advancing a risk-based mechanism for resource allocation and grant making.

Major Efforts to Protect American Embassies

Summary of DOS document, "America Overseas Presence in the 21st Century": The 1999 Report of the Overseas Presence Advisory Panel, which was established by the Secretary of State following the bombings of the embassies in Nairobi and Dar Es Salaam, summarized that the U.S. overseas presence "is near a state of crisis" with insecure and often decrepit facilities, obsolete info technology, outmoded admin and human recourses practices, poor allocation of resources, and competition from the private sector for talented staff threaten to cripple our nation's overseas capability, with far-reaching consequences for national security and prosperity.

The Panel recommended eight major types of changes: (1) Improve security and foster greater accountability for security, (2) Create the right size and sites for our overseas presence, (3) Establish a new entity for the financing and management of our overseas presence, (4) Increase investment in people; adopt best private-sector practices, (5) Immediately upgrade information and communications technology, (6) Reinforce and further improve consular services, (7) Reform administrative services, and (8) Enhance and refocus the role of the Ambassador.

Summary of GAO Report, "Embassy Construction: State Department has Implemented Management Reforms, but Challenges Remain": This 2003 GAO report found: The Overseas Building Office now has mechanisms to more effectively manage the embassy construction program, including (1) an annual plan to guide the planning and execution of the program over a 6-year period; (2) monthly project reviews at HQ; (3) an Industry Advisory Panel for input on current best practices in the construction industry; (4) expanded outreach to contractors to increase the number of bidders; (5) ongoing work to standardize and streamline the planning, design, and construction processes, including initiation of design-build contract delivery and a standard embassy design; (6) additional training for OBO headquarters and field staff; and (7) advance identification and acquisition of sites. GAO believes it is too early to assess the effectiveness of the reforms in ensuring that new embassy and consulate compounds are built within the approved project budget and on time.

Standard Embassy Design (SED) & Construction Method is the most significant breakthrough in new embassy projects since its adoption by the OBO. It is a tool enabling OBO to plan, award, design, and construct new embassy projects more quickly than in the past; to simplify building process; and to provide economically feasible facilities overseas. It consists of a series of documents, including site and building plans, specifications, design criteria, an application manual describing its adaptation for a specific project, and contract requirements.

Summary of challenges impeding speedy improvement of embassy structures includes: Project delays occurring because of such factors as changes in project design and security requirements; difficulties hiring appropriate American and local labor with the necessary clearances and skills; differing site conditions; and unforeseen events such as civil unrest. The government has also had problems coordinating funding for projects that include USAID.

Status of Embassy Upgrades and New Construction: OBO's capital construction program is extensive. At the end of FY03 OBO had 22 new Embassies in the planning

stage, 66 rehabilitation projects underway with 53 planned and 55 Capital Security Construction projects in their Long-Range Overseas Building Plan through FY08.

Summary and Conclusion

America's critical infrastructure and key resources are the "life-lines" for protecting our citizens and economy. Overseas, the U.S. embassies and consulates represent America's front line of efforts to build support for democracy, to maintain peace, and to promote prosperity around the world. Progress is being made on both fronts…but we must stay the course and not loose our resolve to complete the good work which has begun.

Essay #2 – INFRASTRUCTURE RECONSTRUCTION CHALLENGES

Critical to the final victory in the Global War on Terrorism (GWOT) is the restoration of normal life – highly dependent upon the reconstruction of the national infrastructure. However, the historical record of U.S. reconstruction efforts has been far less successful than the U.S. approach to war fighting. The reasons for these failures include: a general lack of interest, a shortage of national will for reconstruction, and an insufficient attention span. The question is how can we learn from this legacy and craft a reconstruction policy that will lead to the successful end to the GWOT.

The Historic US Role in Reconstruction

Prior to becoming a great power, the U.S. post-war role was limited to either survival or consolidation of gains depending on the outcome. This situation changed as the US gained great power status after WWI. As a great power and an active international participant, the US's role has been one of trying to shape the peace in such a way that it benefits both our national interests and the interests of the people of the other nation. Rebuilding a nation's infrastructure – roads, bridges, electrical generation, etc. - is often a good place to start with the reconstruction since it is likely to be damaged or in disrepair.

The "American model" for reconstruction was inspired by Abraham Lincoln's approach to the post-war treatment of the South and hardened by the recognition of the errors committed by the imposition of the treaty of Versailles after WWI. Key to the "American way" is to assist the defeated through foreign aid rather than to punish them through reparations. Under the American way, the goal of the reconstruction effort is to rebuild the nation, establish a capacity for self-governance, and allow U.S. forces to come home. The most critical element in this process is the commitment of the US and its people to the task since reconstruction requires a large commitment of time. In the successful cases of Japan and Germany, the redevelopment activities were done under the auspices of the military and took approximately seven years to complete[58]. In some of the less than successful cases, the US looked for a reason to leave rather than achieving its goal of creating a sustainable state.

The Current US Administered Reconstruction Template

The current reconstruction programs in Iraq and Afghanistan are a combination of the methods used in WWII and the lessons learned from more recent reconstruction efforts in the third world. This method recognizes three key features[59]. First, security is paramount – reconstruction is difficult and costly if security is not in place. Second, a functioning nation requires good governance. Governance creates a legitimate leadership structure which is respected by both the internal population and the world community. The final element is the establishment of an economic basis for the nation. It's in this area that the traditional role of nation building occurs.

[60]

Each of these three elements falls under the purview of either the State Department or the Department of Defense (DoD) alone or in a combination. Security is the easiest to delineate – it is usually under the control of the DoD. Traditionally this was done with US military forces, but increasingly it is being contracted out to various commercial firms after the actual war fighting is concluded. Governance is normally under the direction of the State Department once hostilities have ended. An example of this transition was the replacement of Ret. General Jay Garner after only 30 days as the post conflict governor of Iraq by a State Department sponsored nominee Mr. Paul Bremer[61] to run the Coalition Provisional Authority (CPA). The economic and reconstruction activity is a bit more complex. In Iraq, both the military and State Department took active roles in attempting to use the economic instrument of US power to perform reconstruction work. It's in this area where the construction industry plays a role in the reconstruction and where the "clash of cultures" often occurs.

Our Current Efforts in Iraq and Afghanistan

A key objective of any reconstruction effort is to restore/improve the core of the nation's economy. Restoring the economy creates employment, improves the distribution of goods, and provides a psychological boost to the nation's self esteem. In both Iraq and Afghanistan, the US is attempting to meet this challenge. As mentioned above, doing this takes three elements: a commitment of time, sufficient funding, and a means of implementation.

In both nations, the U.S. has demonstrated that we are willing to invest the necessary time – it has been more than three years since we entered Afghanistan to force out the Taliban government and two years since we entered Iraq. The U.S. still has a considerable troop presence in both nations to provide security and despite the occasional Congressional call for a pull out. In both nations while there has been considerable progress made towards the restoration of infrastructure, much work remains to be done – remember it took 7 years to rebuild both Germany and Japan after WWII[62].

As far as funding goes, the U.S. has shown tremendous generosity to both nations. In addition to funding annual war supplemental spending bills totaling more than $200B, the US has sponsored donor's conferences to obtain additional funds from the world community at large and encourage debt relief measures. Urged on by the US, there has also been a considerable private investment in both countries by companies eager to enter the market place. While the issue of security continues to retard the full impact of relief funding (consuming more than 43% by some estimates)[63], the bottom line is that the US has demonstrated the willingness to fund and support the reconstruction efforts.

The means to accomplish this reconstruction effort are a combination of programs rather than just a single plan. While this method maximizes flexibility, it also creates opportunities for duplication and potential gaps if not properly integrated. The various US reconstruction programs include the following:

- Commander's Emergency Response Program (CERP) – the purpose of the CERP funds is to provide immediate relief at the local level to restore infrastructure, improve the welfare of the citizens, and support education[64]. These funds are aimed at small projects with immediate results.
- Seized Funds (Iraq only) – In Iraq, there was a large amount of funds seized from the former government – estimates range as high as $750M[65] – mainly in cash. These funds were to be used similarly to CERP funds for immediate needs of the Iraqi people.
- Direct Aid – the primary funding for long term reconstruction work was the direct aid provided by the US for administration by US Agency for International Development (USAID). USAID projects include the restoration of electricity, water supplies, water treatment, and other basic infrastructure needed for the counties.

Measuring Our Progress

In both nations the reconstruction effort has made tremendous progress, although neither effort is near completion. Here is a look at the economic reconstruction efforts in each country:

Iraq – The effort in Iraq has benefited from more resources than the effort in Afghanistan. The application of these additional resources, however, has been hindered by a more challenging security situation. Here are the achievements thus far:

CERP funding – more than $578M in funds have been dispersed for more than 34,512 projects. These projects include the building of 364 schools, 67 health clinics, 15 hospitals, 83 rail road stations, 93 water and sewage facilities, and 69 electrical facilities[66]. Each local commander has a budget which allows them to fund various projects at their discretion. Oversight of these projects is provided by the local Corps of Engineers (CoE) representative. For larger projects, they are bumped up to the next level.

Seized funds – More than $750 million in seized funding was spent by the CPA and its predecessor organization before Jan 2004[67]. These funds were used to fund larger projects including the restoration of local government facilities, democracy centers, and women's shelters[68]. A project is submitted by the local military commander to the CPA representative for the region. Due to the larger size of these projects, they attracted bidders from the larger cities as well as the local contractors. To mitigate against unrest caused by outside vendors winning contracts, these contracts received a higher level of scrutiny prior to award. For these contracts, the oversight was also provided by a CoE team assigned to CPA. The potential for overlap was minimized since the local military commander was charged with performing a screen prior to submission.

Foreign Aid funding – In terms of size, this is the majority of the funding available for the reconstruction effort. The US is the largest contributor to the aid budget with $18.4B allocated by Congress for the reconstruction of Iraq's infrastructure[69]. These funds where aimed at the long term reconstruction effort and large projects for electrical generation, water and sewer systems, and public services. For these funds, the projects were generated by the various ministry departments and submitted for the central contracting actions in Baghdad. These contracts were put out for bids to large international firms such as Bechtel and Fluor[70]. Management of these contracts was provided by USAID and the CoE personnel detailed to them performed the oversight.

Afghanistan – The funding and reconstruction process for Afghanistan is similar to that of Iraq, but without the benefit of much of the funding.

CERP funding is similar in process to that of Iraq, but since the amount of CERP funds is proportional to the number of US soldiers, Afghanistan only has 10% of the funds available to units in Iraq – approximately $60M.

Aid Funding – Afghanistan was promised more than $4.5B in aid, however, only the U.S. has fully funded its commitment. The rest of the aid is still promised, but its delivery is unknown with a lack of security most commonly cited as the reason for non-delivery. Due to the nature of the Afghani economy, most of the $2B in U.S. aid has been directed at the recovery of the agriculture segment of the economy[71].

Lessons Learned from Afghanistan and Iraq

There are many lessons learned from our reconstruction activities in both nations. The first is the importance of security. It should surprise no one that it is more difficult to rebuild a nation when some of your projects are destroyed during their construction. However, there are other similarities that go beyond the most basic.

- Need for Immediate results – in both nations the population expected great things once the US freed them from their oppressors. Unfortunately while some small tasks started immediately, the majority of U.S. aid took time to produce tangible results. No one organization was responsible for the time lag, it was just a result of our current process for obtaining funds, getting bids, awarding contracts, and getting started on the work.
- Importance of including local firms – The largest portion of U.S. aid was the projects run by USAID. These were the major infrastructure investments in electricity, water, and road work. The shear size of these projects meant that only a large firm could tackle them. While this meant that the projects were more likely to be completed, it also had the unintended effect of shutting out some local firms on this effort. Employing the local firms is important because they represent the middle class of society and are vital to the overall economic recovery effort.
- Use of local customs and norms – One of the biggest challenges for the reconstruction is setting the building standard. Most of the work funded by the U.S. was required to be done to U.S. standards. While well intended, they didn't take into account local practices. Complying with the U.S. standards equaled higher costs reconstruction, while local practices minimized the benefits gained. In a reconstruction environment, it's difficult to inspire people to be concerned about long term benefits, while they are justifiably focusing on short term survival.

Suggestions for the Future

The reconstruction process which leads to the economic recovery of a nation is very complex. Each recommendation is like one side of a coin and an opposite argument could be made in each case. However, given this environment, we humbly submit the following recommendations.

- Create a common oversight team – The U.S. Army CoE is used by each of the programs to perform oversight, but each one is a separate team rather than being the same. The three separate teams also use the same resource pool which means that more folks have to deploy into theater. By creating a single, common oversight team for the reconstruction; a single integrated coverage plan can be designed to minimize risk and overlap. This would also ensure the use of common standards as well as having the potential to limit the number of CoE folks in theater.
- Integrate management of the redevelopment effort – One of the true challenges in Iraq and Afghanistan is to determine who was funding which project. Since the USAID effort was run by the State Department and the CERP funds by the military, the potential for duplication was inherent in the system. Combined with the different time horizons for each program, and duplication became almost inevitable. Given this potential, a central clearing house organization should be created to

minimize potential duplications of effort and provide clear guidance on the reconstruction effort.

- Replace the war fighting force as soon as possible – One aspect of U.S. policy in both nations that has been hotly debated is the fact that the US military conducted much of the rebuilding effort. The crux of the argument is, how the force that just destroyed the nation can now be in charge of the reconstruction; won't their mere presence become a source of future conflict. In my opinion there is merit to the argument. The solution is therefore to create a reconstruction corps – most likely within the Department of State – to carry out the work after the military has done the security effort. This would be a departure from our past practices, but given the changing nature of warfare, it may be an idea whose time has come.
- Focus on making continuous progress – the true success of the CERP program is that the results solve an immediate need in the community. This creates a sense that something is happening. However, the CERP funds are limited and can't provide the long term infrastructure development that the USAID program does. But similar to the approach used on the Wilson bridge project[72], the USAID efforts can be broken down into smaller component parts creating both quicker results and greater opportunity for local participation.

Conclusion

In summary, the U.S. reconstruction efforts in Iraq and Afghanistan are proceeding along the same path as those taken by Japan and Germany after WWII, which is the path to success. The U.S. has the structure in place so that a sustainable recovery can take place; but we still need to continue the commitment in funds, resources, and time to see the process through to the end. Suggestions to improve the process include creating a common oversight team, integrating the management and oversight portions of the program, creating a non-military organization to lead the effort, and breaking up the major projects to show continuous improvement and increasing the potential for involvement of local firms in the effort.

Essay #3 – LESSONS LEARNED FROM INTERNATIONAL TRAVEL

Locations visited - Tokyo, Japan; Bangkok, Thailand; Beijing and Yi Chang, China.

In each of the venues we visited in East Asia to research the practical application of construction techniques and trends, the importance of continuing the currently amicable bilateral relationship with the United States was readily apparent. For China, the external US consumer market is essential to attaining the national wealth promised by Deng Xiaoping. For the construction industry, China represents huge opportunities for U.S. international firms, but thus far the market has proven to be more of a challenge than earlier estimates for a number of factors listed below.

Thailand is still smarting from the financial crisis of the late 1990's, and many we spoke with expressed concern that the Baht is still sitting on a potentially risky bubble. The government continues to support funding of large port and airport projects that will potentially increase the opportunity for an increased share in the global market and

increased attraction of US and regional manufacturers. The overall goal of Thailand is to position themselves as an alternative to China and the leader of South East Asia.

In the case of Japan, there was an open desire on the part of the industry leaders we visited to continue to work in and with the U.S. Due to cultural concerns, Japanese firms have not been welcomed in China and most of their work there has been for Japanese owned companies. They also expressed concerns about the continued deflationary pressures faced by their economy, now entering its eighth year without any inflation despite government and banking efforts to stimulate the economy. Since they are unable to participate in the Chinese market, the growing U.S. construction market shows great promise for increased volume in a low profit-margin industry for Japanese global firms searching for business.

Some of the perceived strengths observed in the Asian segment of the industry: 1) the Japanese emphasis in research and development of construction techniques and materials, 2) in both China and Thailand, the availability of vast numbers of low cost laborers, 3) Japanese sense of organization, order, and control which led to the accomplishment of major projects on cost and schedule, and 4) China's willingness toward adaptation of new technology in construction techniques (although they didn't seem to be concerned about the legality of how they gained their knowledge).

By the same token, weaknesses also accompany these areas of perceived strength. The vast numbers of laborers lead to very inconsistent application of safety practices on the job site. The use of safety harnesses, as an example, was considered a detriment to being able to complete work rapidly and increase production to increase pay. While not officially acknowledged, there was the distinct impression that injuries and even deaths would be concealed to prevent work stoppage. The use of heavy equipment and more efficient tools or practices was disregarded in favor of cheap manpower with few real labor skills.

Corruption was not raised as an issue in Japan, but was considered a major impediment to progress in Thailand and China. Mega projects, such as the Three Gorges Dam project we visited in China, are impacted by the added costs of corruption that run the gamut from pay-offs to the deliberate use of substandard materials. Materials being imported and products being exported faced the potential of extortion all along the route of transit within Asia.

Another obvious weakness was the wealth gap between those who are tied to the internal markets as opposed to those who are tied to global trade. The lifestyle for residents of Yi Chang is still thirty years behind the modern, clean, and opulent environment of those in Beijing where the construction and retail industries are booming. Burdensome regulation by the government has had a serious impact on the ability of some sectors to join in the benefits of China's economic reform.

Though not directly related to the construction industry, where adaptation is a strength, the lack of respect for intellectual property rights and the open misrepresentation of marketability of goods are rampant throughout the areas we visited in China. This has to be an area that should cause some trepidation for those businesses outside China that would

benefit from a shared business interest, but may suffer the loss of once proprietary information that will eventually cause their displacement in the market.

Opportunities for U.S. firms in the region include the introduction of urban renewal building in the major cities of Asia which are crowded with both expensive and substandard housing. Increasingly the major construction firms in Asia are turning to residential construction as a new outlet for their talents and skills. A final potential growth area for US firms is in the arena of environment remediation. It was acknowledged by the Japanese firms that they are at least 10 years behind the U.S. in terms of technologies and techniques, both Thailand and China are even further behind in this area.

In summary our travels through Asia provided contrasts to our visits domestically. Competitive and deflationary markets are driving many international firms into the growing U.S. construction market. Conversely U.S. firms with state-of-the-art management practices and policies (for example construction management expertise, CAD and excellent safety training) have an advantage over most foreign firms which can be exploited in competing for international work. The future of construction in Asia looks bright due to a growing population and wealth; U.S. construction firms should continue to expand beyond their current foothold in the region.

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